Name _____ Date _____ Class _____

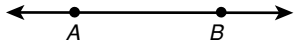
LESSON 1-1

Reading Strategies

Identify Relationships

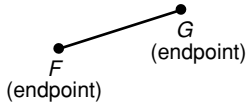
In geometry, many figures can be broken down into three basic building blocks: points, lines, and planes.

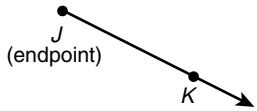
Consider the following:

- A **point** names a location and has no size. • *P*
- A **line** is a straight path that extends forever in two directions. 

- A **plane** is a flat surface that extends forever. 

Use that information to think about the following definitions:

- A **segment** is part of a line and consists of two points and all the points in between. 

- An **endpoint** is a point at the end of a segment or a ray.
- A **ray** is a part of a line that starts at an endpoint and extends forever in one direction. 

Answer each question.

1. How are a line and a line segment the same?

_____

2. How are a line and a line segment different?

_____

3. How are a line segment and a ray the same?

_____

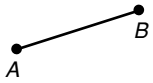
4. How are a line segment and a ray different?

_____

Identify the following.

5. • *Y*

_____

6. 

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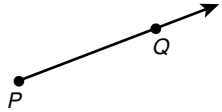
7. 

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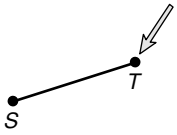
8. 

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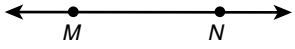
9. 

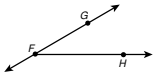
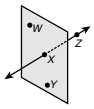
_____

10. 

_____

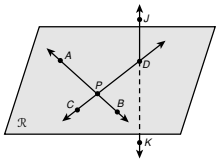
LESSON 1-1 Reteach

Understanding Points, Lines, and Planes continued

Term	Meaning	Model
collinear	points that lie on the same line	 *F* and *G* are collinear. *F*, *G*, and *H* are noncollinear.
noncollinear	points that do not lie on the same line	
coplanar	points or lines that lie in the same plane	 *W*, *X*, and *Y* are coplanar. *W*, *X*, *Y*, and *Z* are noncoplanar.
noncoplanar	points or lines that do not lie in the same plane	

Figures that intersect share a common set of points. In the first model above, $\overleftrightarrow{FH}$ intersects $\overleftrightarrow{FG}$ at point *F*. In the second model, $\overleftrightarrow{XZ}$ intersects plane *WXY* at point *X*.

Use the figure for Exercises 9–14. Name each of the following.



9. three collinear points

Possible answers: *A*, *P*, and *B*; *C*, *P*, and *D*; *J*, *D*, and *K*

10. three noncollinear points

Sample answer: *A*, *P*, and *D*

11. four coplanar points

Sample answer: *C*, *P*, *B*, and *D*

12. four noncoplanar points

Sample answer: *J*, *D*, *P*, and *B*

13. two lines that intersect $\overleftrightarrow{CD}$

$\overleftrightarrow{AB}$ and $\overleftrightarrow{JK}$

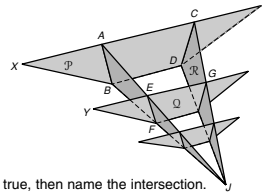
14. the intersection of $\overleftrightarrow{JK}$ and plane $\mathcal{R}$

point *D*

LESSON 1-1 Challenge

Exploring Relationships

Use the figure of the kite for Exercises 1–4.



1. Name three collinear points that lie in plane $\mathcal{P}$.

X, *A*, *C*

2. Name a point that is coplanar with *Y* and *F*.

Sample answer: *E*

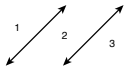
3. Name two planes that intersect $\overline{CD}$.

$\mathcal{P}$ and $\mathcal{R}$

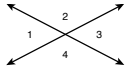
4. Write True or False: $\overleftrightarrow{AE}$, $\overleftrightarrow{CG}$, and $\overleftrightarrow{FJ}$ intersect. If true, then name the intersection. If false, then explain why the lines do not intersect.

True; the lines intersect at point *J*.

Lines in a plane divide the plane into **regions.** The number of regions depends on the relationship between the lines. Consider two lines in a plane.



If the lines are parallel, three regions are determined.



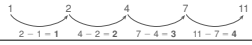
If the lines intersect, four regions are determined.

5. a. Complete the table.

b. Describe the pattern in the table.

Sample answer: The pattern is one of increasing differences.

Number of lines in a plane	0	1	2	3	4
Greatest number of regions determined	1	2	4	7	11

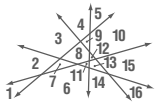


c. Predict the greatest number of regions determined by five lines in a plane.

16 regions (16 − 11 = 5)

d. On a separate sheet of paper, make a drawing to verify your prediction from part c.

Answer: 5d. Drawings will vary.



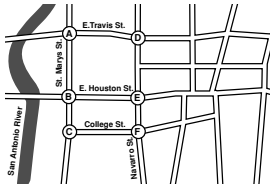
6. You can use an approach similar to the one in Exercise 5 to investigate the greatest possible number of points of intersection for *n* lines in a plane. Make a table and look for a pattern. What is the greatest possible number of points of intersection for six lines in a plane?

15

LESSON 1-1 Problem Solving

Understanding Points, Lines, and Planes

Use the map of part of San Antonio for Exercises 1 and 2.



1. Name a point that appears to be collinear with $\overline{EF}$. Which streets intersect at this point?

Point *D*; E. Travis St. and Navarro St.

2. Explain why point *A* is NOT collinear with $\overline{BE}$.

Point *A* does not lie on the line that contains $\overline{BE}$.

3. Suppose $\overline{UV}$ represents the pencil that you are using to do your homework and plane $\mathcal{P}$ represents the paper that you are writing on. Describe the relationship between $\overleftrightarrow{UV}$ and plane $\mathcal{P}$.

Sample answer: $\overleftrightarrow{UV}$ intersects plane $\mathcal{P}$.

4. Two cyclists start at the same point, but travel along two straight streets in different directions. If they continue, how many times will their paths cross again? Explain.

0 times; if two lines intersect, then they intersect in exactly one point.

Choose the best answer.

5. In a building, planes $\mathcal{W}$, $\mathcal{X}$, and $\mathcal{Y}$ represent each of the three floors; planes $\mathcal{Q}$ and $\mathcal{R}$ represent the front and back of the building; planes $\mathcal{S}$ and $\mathcal{T}$ represent the sides. Which is a true statement?

A Planes $\mathcal{W}$ and $\mathcal{Y}$ intersect in a line.
B Planes $\mathcal{Q}$ and $\mathcal{X}$ intersect in a line.
C Planes $\mathcal{W}$, $\mathcal{X}$, and $\mathcal{T}$ intersect in a point.
D Planes $\mathcal{Q}$, $\mathcal{R}$, and $\mathcal{S}$ intersect in a point.

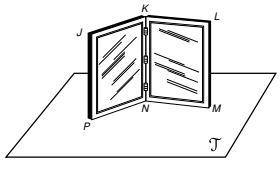
6. Suppose point *G* represents a duck flying over a lake, points *H* and *J* represent two ducks swimming on the lake, and plane $\mathcal{L}$ represents the lake. Which is a true statement?

F There are two lines through *G* and *J*.
G The line containing *G* and *H* lies in plane $\mathcal{L}$.
H *G*, *H*, and *J* are noncoplanar.
J There is exactly one plane containing points *G*, *H*, and *J*.

Use the figure for Exercise 7.

7. A frame holding two pictures sits on a table. Which is NOT a true statement?

A $\overline{PN}$ and $\overline{NM}$ lie in plane $\mathcal{T}$.
B $\overline{PN}$ and $\overline{NM}$ intersect in a point.
C $\overline{LM}$ and *N* intersect in a line.
D *P* and $\overline{NM}$ are coplanar.



LESSON 1-1 Reading Strategies

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In geometry, many figures can be broken down into three basic building blocks: points, lines, and planes.

Consider the following:

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- A **line** is a straight path that extends forever in two directions. 
- A **plane** is a flat surface that extends forever. 

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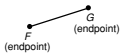
- A **segment** is part of a line and consists of two points and all the points in between. 
- An **endpoint** is a point at the end of a segment or a ray.
- A **ray** is a part of a line that starts at an endpoint and extends forever in one direction. 

Answer each question.

1. How are a line and a line segment the same?

A line segment is a specific portion of a line that begins and ends.

2. How are a line and a line segment different?

A line goes on forever in both directions, while a segment has endpoints.

3. How are a line segment and a ray the same?

A ray and a line segment are both parts of a line.

4. How are a line segment and a ray different?

A line segment has 2 endpoints. A ray has 1 endpoint and extends forever in one direction.

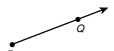
Identify the following.

5. • *Y*

point

6. 

segment

7. 

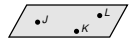
ray

8. 

endpoint

9. 

line

10. 

plane